II. TRANSPORTATION PLANNING CHALLENGES

The SCAG region is one of the largest and most complex metropolitan areas in the nation, and its transportation challenges are equally large and complex. This chapter describes growth trends and travel patterns in the SCAG region and the challenges that these trends and other factors pose for our multimodal transportation system.

The Shape and Pattern of Future Growth

Southern California is running out of land to support low density future growth. The ocean and mountains pose natural barriers to development. Environmentally sensitive areas, such as coastal wetlands and natural habitat areas, hem in the region and dot the urbanized area. A significant amount of land is also owned by the state and federal government for the public benefit and is off-limits to development.

Freeways provide access to farm land and grazing areas that could be used to accommodate future growth along the east-west axis of the region. There is little access to the north except through mountain passes that are choked with car and truck traffic. The centrifugal force of growth continues to push the development footprint of the urbanized area outward. At the same time, pushing back on dispersed development are natural barriers, financial constraints to pay for outward expansion, and public resistance to unsustainable "leap frog" growth into green fields and sensitive habitat areas. Nearly all natural locations for urban development have been consumed, leaving us with hard choices about how we are to grow and change to meet the demands of the future.

Much of the urbanized area is fighting gridlock as 95 percent or more of the population drives back and forth to work to accomplish the tasks of daily living, and another 3 to 5 percent take transit or walk. Growth management strategies and ballot initiatives are aimed at preserving and protecting prime farm and grazing land from residential development pressures, while preserving historic buildings, single family neighborhoods and prime industrial land for economic development.

Many are starting to realize that, as large as the region is in total area, it is running out of developable land to support a significantly unbalanced auto-oriented development pattern. There is an increasing need for reinvestment and increased development near public transit, along corridors and in-town, mixed use urban centers. The blueprint for this growth vision, described in greater detail in Chapter III, has at its heart the notion that promotion of a more compact urban form for the region that uses existing infrastructure and preserves natural areas is important for sustaining a higher quality of life for all Southern Californians.

Southern California has the nation's largest bus ridership and an emerging metro, commuter, and light rail transit network that provides a better balance of transportation choices that can reduce auto travel and support more pedestrian, mixed use and transit oriented development. This compact urban form is intended to put homes and jobs closer together, reducing fuel consumption, vehicle miles traveled and greenhouse gas emissions, even as we continue to increase population, add employment and grow sustainably.

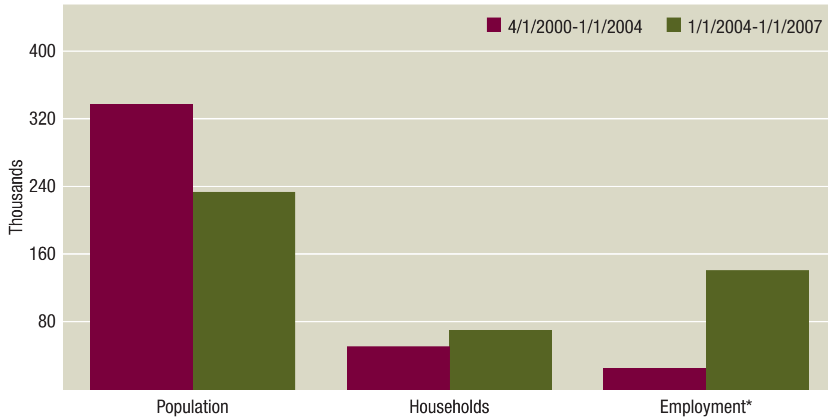
This section describes the population, employment, and demographic changes that happened in the recent past and may be expected in the SCAG region over the next 30 years without a change in regional policy. These demographic and economic changes are an integral part of planning the transportation system to ensure that the users' needs are addressed.

POPULATION GROWTH

The SCAG region is the second most populated metropolitan area in the United States. Nearly one-half of all Californians live in the SCAG region, and 1 in 17 people living in the entire United States resides here. By July 1, 2007, the region's population had reached 18.6 million residents, having grown by 2 million residents (12 percent) from 16.6 million people just seven years ago. The population growth (2 million residents) of the SCAG region between 2000 and 2007 was higher than the population growth (1.9 million residents) that occurred throughout the 1990s. Figure 2.1 shows the growth pattern of population, households, and employment between 2000 and 2007.

Population growth slows down in the middle 2000s (2004-2007), while both household and employment growth are much faster in the middle 2000s than in the early 2000s.

FIGURE 2.1 ANNUAL AVERAGE GROWTH IN POPULATION, EMPLOYMENT, AND HOUSEHOLDS, 2000-2004 AND 2004-2007

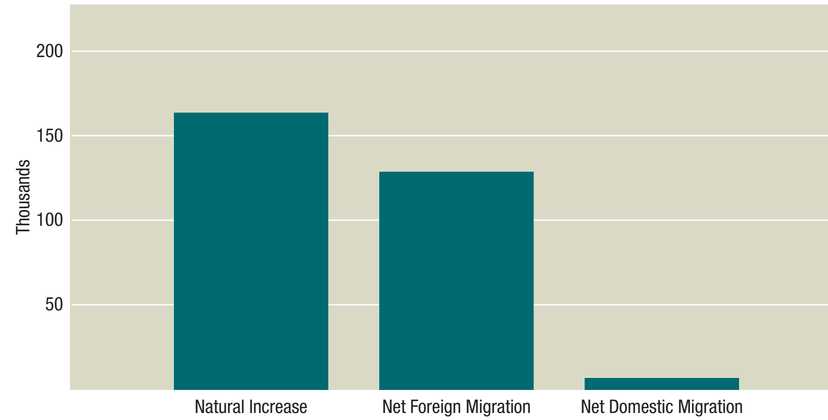


Source: California Department of Finance, California Employment Development Department, SCAG Employment Estimates

Two major sources of population growth since the 2000 Census are natural increase (births minus deaths) and net foreign immigration (people who move here from foreign countries minus those who move away to foreign countries). Natural increase accounted for 55 percent of the population gain in the region. Although total fertility rate of women of child bearing ages remains stable in recent years, Hispanic women still maintain a relatively higher total fertility rate. The life expectancy of Southern California residents increased while the death rate decreased.

Net foreign immigration, mostly from Mexico, Central America, and Asia, accounted for 43 percent of the population gain in the region. Foreign immigration, including unauthorized immigrants, was not affected by the region's economic cycle. Southern California is still an attractive destination and a gateway for new immigrants, although international migration to the region has leveled off in recent years.

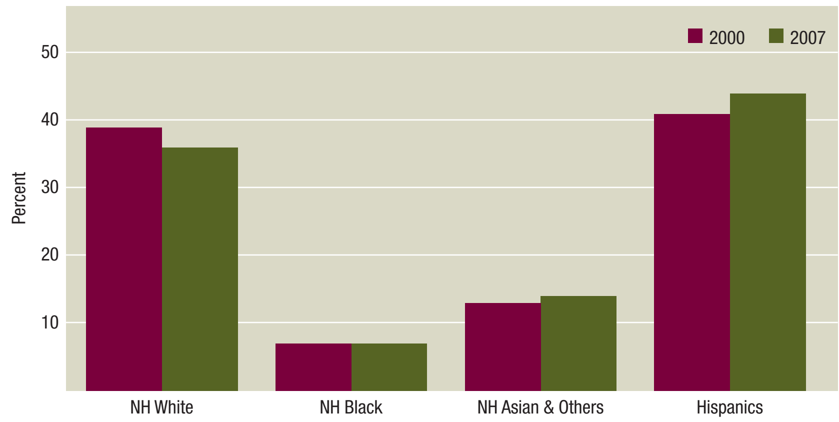
FIGURE 2.2 COMPONENTS OF ANNUAL POPULATION GROWTH, 2000-2006



Source: California Department of Finance

As of July 1, 2007, there is no racial or ethnic majority in the region. Hispanics constitute 44 percent of the region's population, followed by Non-Hispanic (NH) Whites at 36 percent, NH Asians and Others at 13 percent, and NH Blacks at 7 percent. Since 2000, Hispanics have increased their share of the population by 3 percent, while NH Whites have decreased their share by the same percentage. There has been little change in the share of other racial/ethnic groups between 2000 and 2007. The region is moving toward an Hispanic majority.

FIGURE 2.3 ETHNIC COMPOSITION OF POPULATION, 2000 AND 2007



Source: California Department of Finance

The region shows an aging pattern of population growth between 2000 an 2007. According to California Department of Finance (DOF) estimates, nearly 80 percent of population growth occurred in the age group of 36 years old or older. Age groups of 4-10 years old and 27-35 years old declined by 6 percent and 8 percent, respectively, over the same period. The absolute decline of school age children and younger adults raises a concern about future school construction needs and labor force in younger workers.

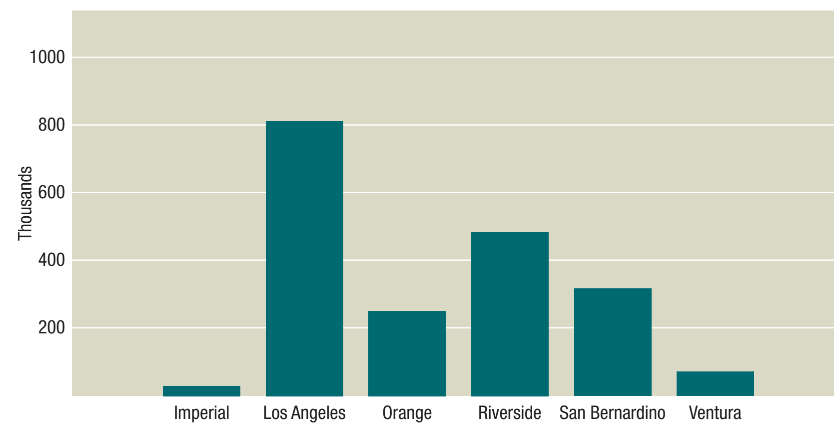
TABLE 2.1 AGE COMPOSITION OF POPULATION, 2000 AND 2007

Age	7/1/2000	7/1/2007	Change	% Change
0-3	1,017,000	1,078,000	62,000	6%
4-10	1,977,000	1,868,000	(109,000)	-6%
11-26	3,885,000	4,528,000	642,000	14%
27-35	2,413,000	2,227,000	(187,000)	-8%
36+	7,333,000	8,860,000	1,526,000	17%
Total	16,626,000	18,560,000	1,934,000	12%

Source: SCAG Baseline Growth Forecast

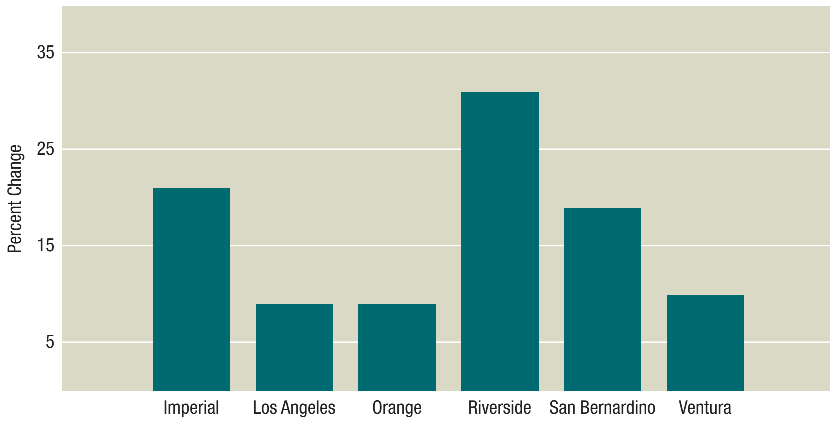
Los Angeles County accounted for 41 percent of the region's growth over the last seven years, adding 813,000 residents, while Riverside and San Bernardino Counties together added 804,000 residents. In terms of relative growth, the Inland Empire and Imperial Valley are the fastest growing areas in the region. Riverside County grew by 40 percent, San Bernardino Country by 19 percent and Imperial County by 22 percent. Nearly 46 percent of the region's growth occurred in areas outside of Los Angeles and Orange Counties. Los Angeles and Orange Counties were the slowest growing counties, adding only 9 percent each to its population during the same period.

FIGURE 2.4 POPULATION GROWTH BY COUNTY, 2000-2007



Source: California Department of Finance

FIGURE 2.5 PERCENT GROWTH IN POPULATION BY COUNTY, 2000-2007



Source: California Department of Finance

HOUSEHOLD GROWTH

Since the 2000 US Census, there was a net addition of 410,000 households bringing the regional total to nearly 5.8 million in 2007. However, population growth outpaced household growth with only one household for every five persons added. The rapidly growing population is reflected in larger households rather than in the formation of new households. The average persons-per-household ratio in the region has increased from 3.07 in 2000 to 3.19 in 2007. The increasing household size may be caused by the cultural propensity of some groups such as recent immigrants to form the large intergenerational families or by the limited supply of affordable housing units. Workforce housing affordability and availability issues have affected the quality of life in the region. The insufficient supply of affordable housing in job-rich urban areas maintains existing trends in urban sprawl, longer commute patterns, congested freeways and worsening air quality.

EMPLOYMENT GROWTH

In 2006, the region's total employment, including self-employment, was estimated to be nearly 8 million, having grown by 500,000 jobs (7 percent) from 2000. The region's economy is robust in terms of the number and the type of jobs available to residents looking for jobs, with the unemployment rate of the region at an historic low at 4.6 percent in 2006. The previous record in the region was 5 percent in 2000. The region's employment has been steadily growing since the recession of the early 1990s. The region experienced a net loss of 500,000 jobs during the recession period between 1990 and 1993, then overcame the recession by adding a net 780,000 jobs between 1996 and 2000. After slow growth in jobs in 2002 and 2003, the region is regaining its economic strength by increasing new annual job growth beyond these early decade levels.

The overall pattern of employment change is driven by the decline in manufacturing sector jobs due to globalization. Between 2000 and 2006, the manufacturing sector jobs dropped from1 million jobs to 835,000 jobs, a loss of 188,000 jobs. The share of the manufacturing sector jobs declined by 3 percent. Other significant economic sectors experiencing the absolute loss of jobs include 1) information, 2) agriculture and mining, and 3) transportation and warehousing, and utility. In contrast, 1) construction, 2) financial activity, 3) leisure and hospitality, 4) retail trade, and 5) other service sectors added a significant amount of additional jobs to the regional economy. The growth of construction and financial activity sectors was caused by the strong residential housing development. The increases in some service sector jobs are directly associated with the increase in total population and an increase in the aged population in the region. The growth of service sectors, in particular, population serving jobs, is likely to continue in the future.

The strong regional job growth directly influences domestic migration, because it induces more domestic in-migration than domestic out-migration, while the weak job growth causes more domestic out-migration than domestic in-migration. More net in-migration influences the job growth in the "population-serving" retail and service sectors.

TABLE 2.2 EMPLOYMENT BY SECTOR, 2000 AND 2005

Sectors (NAICS)	2000		2005		Change		
	Number	%	Number	%	Number	% Change	Change in %
Agriculture & Mining	84,000	1%	78000	1%	(6,000)	-7%	0%
Construction	369,000	5%	465000	6%	96,000	26%	1%
Manufacturing	1,023,000	14%	835,000	11%	(188,000)	-18%	-3%
Wholesale Trade	374,000	5%	386,000	5%	12,000	3%	0%
Retail Trade	770,000	10%	841,000	11%	71,000	9%	1%
Transportation and Warehousing, and Utility	354,000	5%	349,000	4%	(5,000)	-1%	0%
Information	324,000	4%	278,000	4%	(46,000)	-14%	-1%
Financial Activities	415,000	6%	504,000	6%	89,000	21%	1%
Professional and Business Services	1,167,000	16%	1,197,000	15%	30,000	3%	0%
Education and Health Services	1,429,000	19%	1,546,000	20%	117,000	8%	1%
Leisure and Hospitality	664,000	9%	746,000	10%	82,000	12%	1%
Other Services	293,000	4%	313,000	4%	20,000	7%	0%
Public Administration	217,000	3%	234,000	3%	17,000	8%	0%
Total	**7,482,000**	**100%**	**7,771,000**	**100%**	**289,000**	**4%**	**0%**

Source: California Employment Development Department, SCAG Employment Estimates

INCOME

Income is one of most important indicators of economic well-being of residents in the region. In 1999, per capita income of the region, as a measure of the wealth of the residents, was approximately $21,000. By 2006, this amount grew to $25,000, an increase of 20 percent. After adjusting for inflation, per capita income of the region has been declined from 1999 to 2006 (-5.7%). Per capita income of the region remains at the same level of the nation, but is lower than that of California by 6 percent. The relative income level of the region to the nation has declined from 1.27 in 1959 to 0.98 in 1999. Over the last three decades, the SCAG region's per capita income ranking dropped from the 4th highest in 1969 to 7th in 1989, and 16th in 1999. The SCAG region continued to rank last in terms of per capita income among the 17 largest metropolitan regions in the nation in 2005.

Median household income increased by 22 percent from 1999 to 2006. However, this increase was only about 80 percent required to keep up with inflation. Thus, real median household income was down by 4%. In 2006, median household income of the region was 15 percent above the national average, but was lower than that of California by 1.5 percent. The relative income level of the region to the nation has remained 9 percent to 23 percent above the national average for the periods of 1969, 1979, 1989, and 1999. The relative median household income level of the region has increased from 1.09 in 1999 to 1.15 in 2006.

Average income statistics, however, mask how much poverty is present in the region. In 2006 nearly 14 percent of the region's residents lived in poverty compared to around 13 percent for California and the nation as a whole. Around 18 percent of Imperial County residents live in poverty, followed by Los Angeles County at 15 percent. The poverty rates of Ventura, Orange, and Riverside County residents are lower than that of California or the nation.

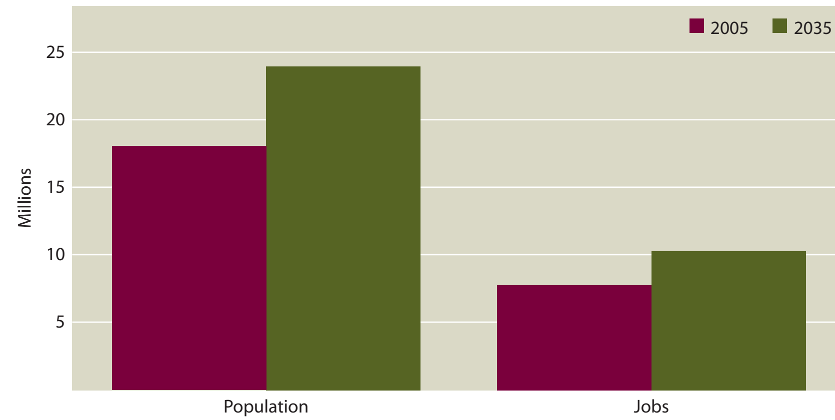
Partly because of the higher than national average poverty levels and partly because of the high cost of home ownership in California, the region lags the nation in homeownership rates. During the last decade, median home values in California and the most populous areas of the region have risen due to construction activity lagging population growth, low inventory and historically low interest rates. Median home values in California now reach the $462,000 mark, which is more than double the national median. In 2006, 56.5 percent of regional residents owned their own home compared to 67.3 percent for the nation as a whole

PATTERNS OF FUTURE GROWTH

A baseline growth forecast is a technical growth forecast of the most likely population and employment level in the future, without regional policy input. It reflects historical trends, based on reasonable key technical assumptions and existing and newly approved local or regional projects. Specifically, the baseline growth forecast is a result of updating the 2004 RTP no-project growth forecasts with the current demographic and economic trends, the latest land use changes, newly approved regionally significant projects, general plan or specific plan updates, and/or zoning revisions. Also included are demand forecasts for cargo and passengers at the regional ports and airports. The port and airport demand forecasts include projects that improve operations and increase capacity. Intermodal expansion was assumed in terms of additional capacity at the ports for goods movement growth, and the trips associated therewith were assumed located in the Inland Empire. The VMT and related emissions regarding such trips are incorporated into the modeling analysis.

According to the baseline growth forecast summarized in Figure 2.6, the region will add 5.9 million people to reach 24 million people by 2035. Supporting this population in 2035 will be a total of 10.3 million jobs in 2035 with 2.5 million new jobs. This level of population and job growth is expected to yield 2 million additional households in the region at an average of three persons per household. The substantial amount of projected growth will pose serious transportation and air quality challenges for the region.

FIGURE 2.6 POPULATION AND EMPLOYMENT, 2005 AND 2035



Source: California Department of Finance, California Employment Development Department, SCAG Employment Estimates, SCAG Baseline Growth Forecast

TABLE 2.3 SOCIOECONOMIC INDICATORS, 2005 AND 2035

	2005**	2035	Change	% Change
Total population ('000), % Change (2005-2035)	18,147	24,056	5,909	33%
Persons under 16 years old (%)	24.4	21.4	-2.9	
Persons 16-64 years old (%)	65.7	62.7	-3.0	
Persons 65 years old and over (%)	9.9	15.9	6.0	
Median age	32.9	35.9	3.1	
Total dependency ratio*	52.1	59.5	7.4	
Child dependency ratio	37.1	34.2	-2.9	
Old-age dependency ratio	15.1	25.3	10.3	
Births per 1,000 population	15.9	14.4	-1.4	
Total fertility rate (per woman)	2.05	2.02	-0.03	
Deaths per 1,000 population	6.3	6.9	0.7	
Natural increase (%) (2000-2005, 2005-2035)	55.0	84.0		
Net migration (%) (2000-2005, 2005-2035)	45.0	16.0		
Non-Hispanic White persons (%)	36.0	21.9	-14.1	
Non-Hispanic Black persons (%)	7.1	5.8	-1.2	
Non-Hispanic Asian & Other persons (%)	13.8	17.0	3.3	
Hispanic persons (%)	43.1	55.2	12.0	
Households ('000), % Change (2005-2035)	5,687	7,710	2,023	36%
Total population per household (PPH)	3.19	3.12	-0.07	
Householders 65 years old and over (%)	17.3	26.5	9.2	
Total employment ('000), % Change (2005-2035)	7,771	10,287	2,516	32%
Agriculture & Mining (%)	1.0	0.8	-0.2	
Manufacturing (%)	10.7	7.7	-3.0	
Service (%)	**88.3**	**91.5**	**3.2**	

*Notes: * A measure showing the number of dependents (aged 0-15 & over 65) per 100 working age population (aged 16-64). Dependents per 100 working age population.*
*** Model estimate*
Source: SCAG Baseline Growth Forecast

Where will all these people come from? Approximately 85 percent of the region's population growth in the future is due to natural increase. The region is expected to experience a net loss in domestic migration, but this will be more than offset by international immigration. As the region grows, the average person will be older, and Hispanics will become the majority ethnic group. The population in the region will become older because of aging "baby boomers.", born between 1946 and 1964. The median age will rise from 32.9 years in 2005 to 35.9 in 2035. The population aged 65 and older will grow four-and-a-half times faster than the working age population (16-64 years old) between 2005 and 2035. As a result, workers in the region would support a larger share of older "baby boomer" population in 2035.

FIGURE 2.7 POPULATION AGE PYRAMID, 2005 AND 2035

Source: SCAG Baseline Growth Forecast

Due to the retirement of "baby boomers," the region may experience severe shortages of skilled labor. The aging baby boomers may postpone the retirement or the female labor force may increase the labor force participation. If domestic migration does not make up the shortage of skilled labor, then more foreign immigration will be needed. The skills of the new labor force, particularly recent immigrants, will probably not match the requirements of the skilled jobs. This could depress the overall income level of the workers and households. Long-term strategies to achieve growth and equitable distribution of income should be considered, including appropriate and enhanced educational opportunities and a phased retirement system.

Shifting demographic patterns will also influence travel behavior. The elderly people travel less than the younger population and the elderly workers tend to work at home. If necessary, they commute to work for a shorter distance. Recent immigrants tend to use public transportation much more than other population groups. Urban density levels may also increase since foreign-born residents urbanize less land. Many SCAG region foreign-born, Hispanic, and Asian residents have modest incomes, larger household sizes, and tend to double up in existing urban areas, thereby increasing population density. The socioeconomic characteristics and lifestyle choices associated with immigration are consistent with a more compact urban form.

The overall number of persons per household will be smaller in the region in 2035 as the downward pressures are exerted by aging "baby boomers" and lower birth rates, while there are upward pressures from increasing Hispanic populations with relatively large households (especially recent immigrants). The number of persons per household may increase in some built-out areas over the projection horizon due to the limited availability of developable land. The racial and ethnic composition of households will reflect the population diversity and create demand for a wider variety of housing types than are most prevalent today. Specifically, there will be more need for close-in and infill housing, condominiums and multi-family housing.

Jobs will be created across all employment sectors, except the manufacturing sector. The largest gains will be in service sector jobs as the shift in the region from manufacturing jobs to service sector jobs continues. Between 2005 and 2035, service sector jobs will lead in total growth and comprise the largest share of total jobs. The makeup of service sector jobs will also change, with different employment opportunities. Three top leading sectors include 1) education and health services, 2) professional and business services, and 3) construction. These fast growing sectors are supported by the continued growth of population and demographic changes (e.g., aging of baby boomers). With continued globalization, the share of the manufacturing sector will continue to decline its share from 11 percent in 2005 to 8 percent in 2035. The manufacturing sector still remains important and there are growth opportunities in the high tech manufacturing sector. The decline of the manufacturing sector might result in the lower income level of workers and households. The policy strategies might focus on creating more high-wage and salary service sectors, which include 1) information, 2) public administration, 3) financial activities, 4) wholesale trade, and 5) transportation and warehousing, and utilities. The logistics sector, comprising of wholesale trade, transportation, and warehousing, might become more important in the region's economic growth as the region's foreign trade activities continue to grow. The significant growth of the construction sector might influence the future traffic congestion in the region. The workers in the construction sector tend to commute to work for the longer distance, but they use carpooling much more than other workers.

TABLE 2.4 EMPLOYMENT BY SECTOR, 2005 AND 2035

Sectors (NAICS)	2005		2035		Change		
	Number	%	Number	%	Number	% Change	Change in %
Agriculture & Mining	78,000	1%	86,000	1%	8,000	10%	0%
Construction	465,000	6%	687,000	7%	222,000	48%	1%
Manufacturing	835,000	11%	792,000	8%	(43,000)	-5%	-3%
Wholesale Trade	386,000	5%	458,000	4%	72,000	19%	-1%
Retail Trade	841,000	11%	1,122,000	11%	281,000	33%	0%
Transportation and Warehousing, and Utility	349,000	4%	418,000	4%	69,000	20%	0%
Information	278,000	4%	362,000	4%	84,000	30%	0%
Financial Activities	504,000	6%	601,000	6%	97,000	19%	-1%
Professional and Business Services	1,197,000	15%	1,770,000	17%	573,000	48%	2%
Education and Health Services	1,546,000	20%	2,299,000	22%	753,000	49%	2%
Leisure and Hospitality	746,000	10%	1,027,000	10%	281,000	38%	0%
Other Services	313,000	4%	366,000	4%	53,000	17%	0%
Public Administration	234,000	3%	301,000	3%	67,000	29%	0%
Total	**7,771,000**	**100%**	**10,287,000**	**100%**	**2,516,000**	**32%**	**0%**

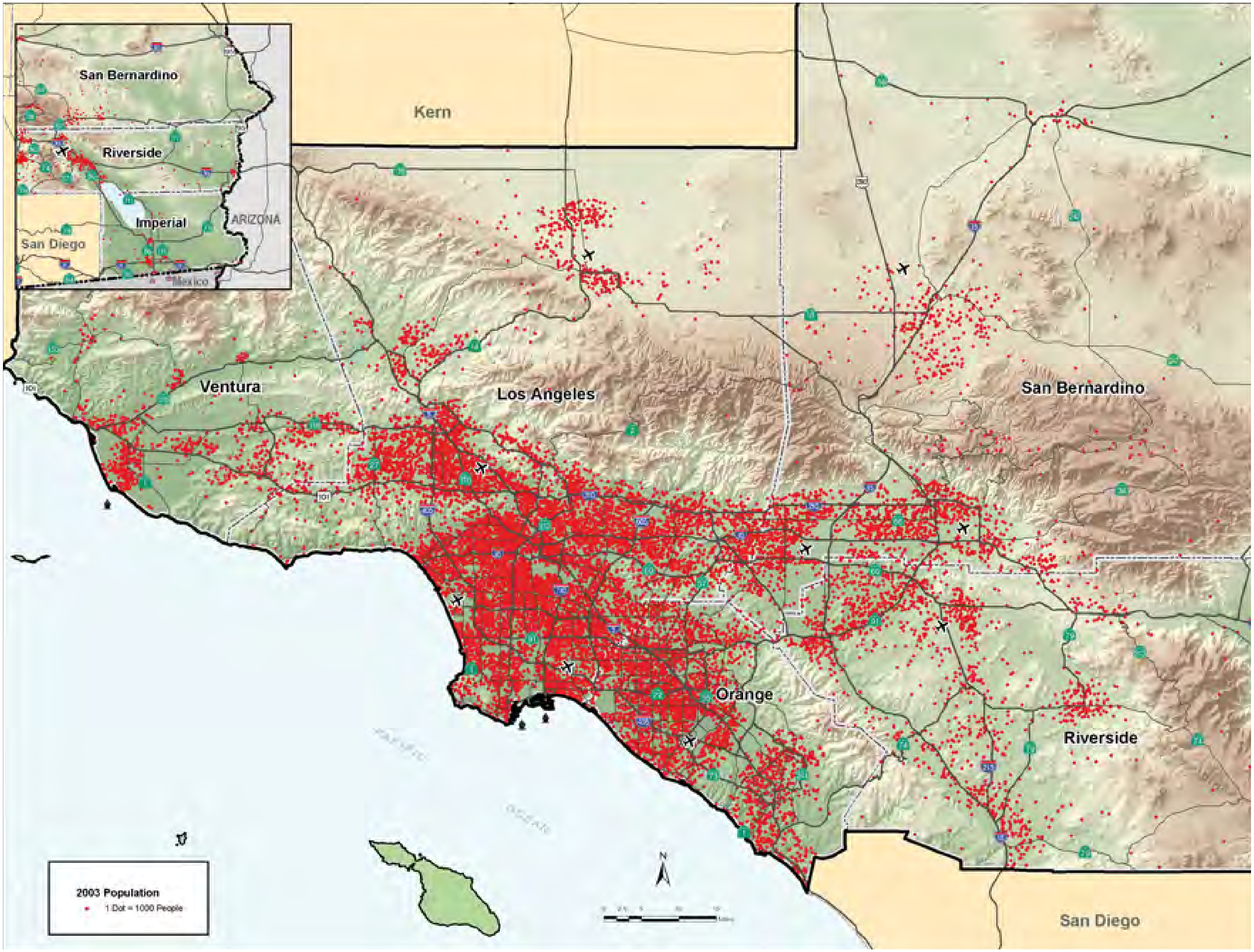
Source: SCAG Baseline Growth Forecast

The overall economic well-being of residents in the region improves during the planning period. The median household income of the region is expected to increase by one-half percent per year from $46,000 (in 1999 dollars) in 2005 to $53,000 (in 1999 dollars) in 2035. The higher income households with more than $100,000 (in 1999 dollars) increase two or three times faster than

low and middle income households. The projected income level and distribution affects auto ownership, trip generation, and mode choice. For example, the higher household income implies more cars available for travel, more trip generation, and more driving than transit use.

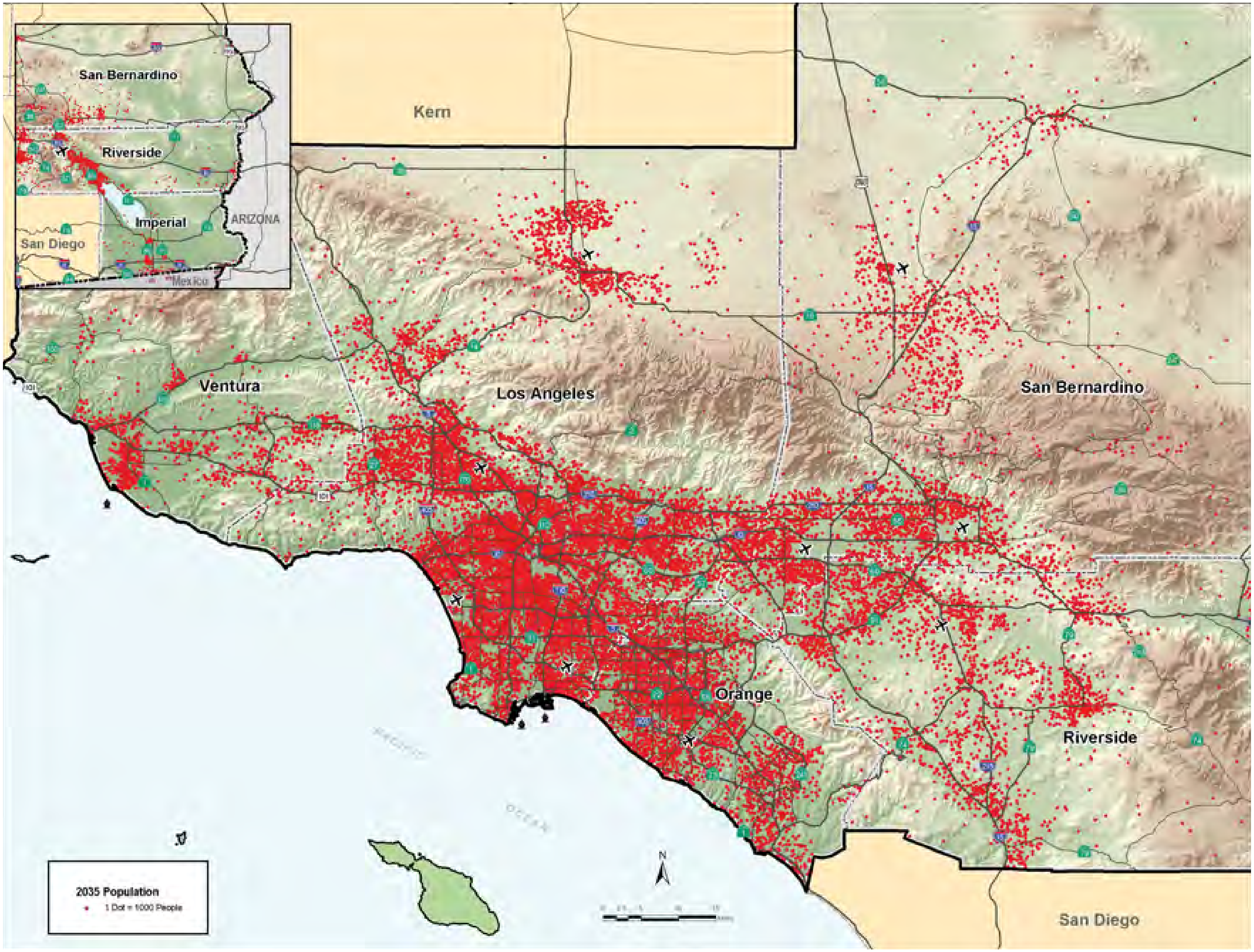
Table 2.5 summarizes the draft baseline growth forecast versus the policy growth forecast by county in terms of 2035 population, households, and employment. Although the baseline growth forecast extrapolates the historical growth trends, the policy growth forecast calls for an advisory redistribution of growth at the county, subregion, city, and transportation analysis zone (TAZ) levels. The implementation of the policy growth forecast would be voluntary and it complements the baseline growth forecast. Chapter III outlines the policy forecast that hinges upon a growth vision strategy for the region that integrates land use and transportation planning.

EXHIBIT 2.1 2003 POPULATION



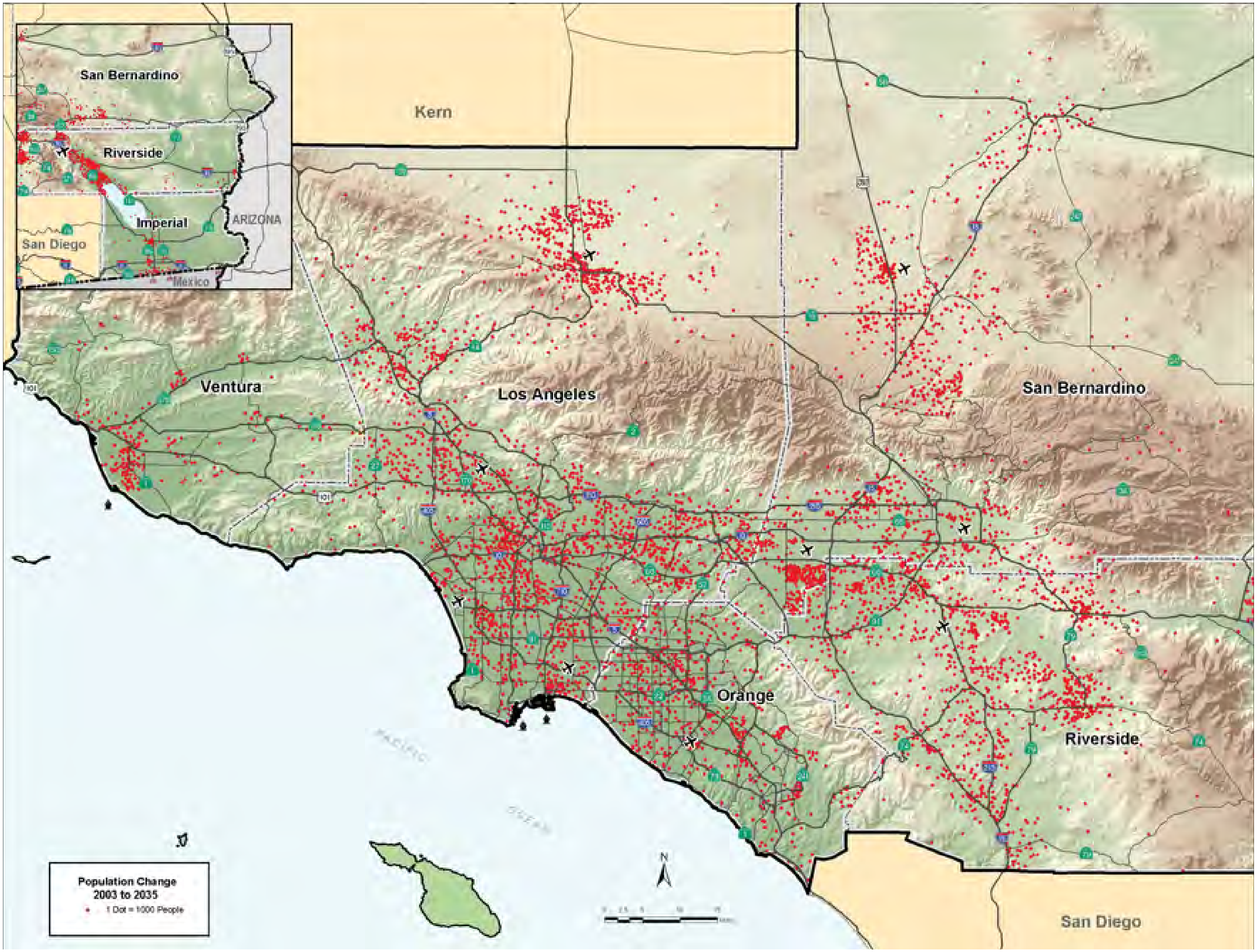
Source: Southern California Association of Governments, ESRI StreetMap USA, Teleatlas

EXHIBIT 2.2 2035 POPULATION



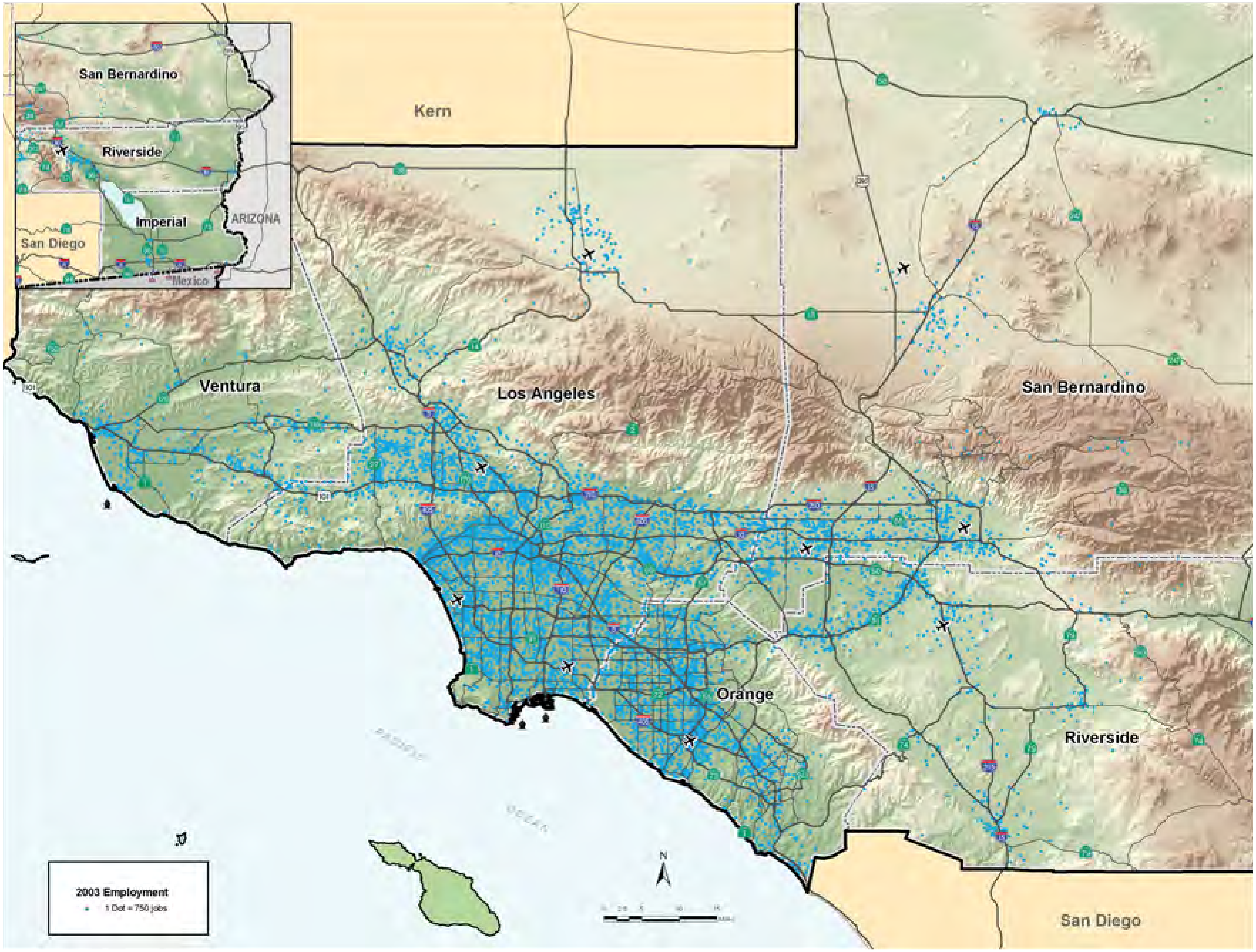
Source: Southern California Association of Governments, ESRI StreetMap USA, Teleatlas

EXHIBIT 2.3 POPULATION INCREASE, 2003-2035



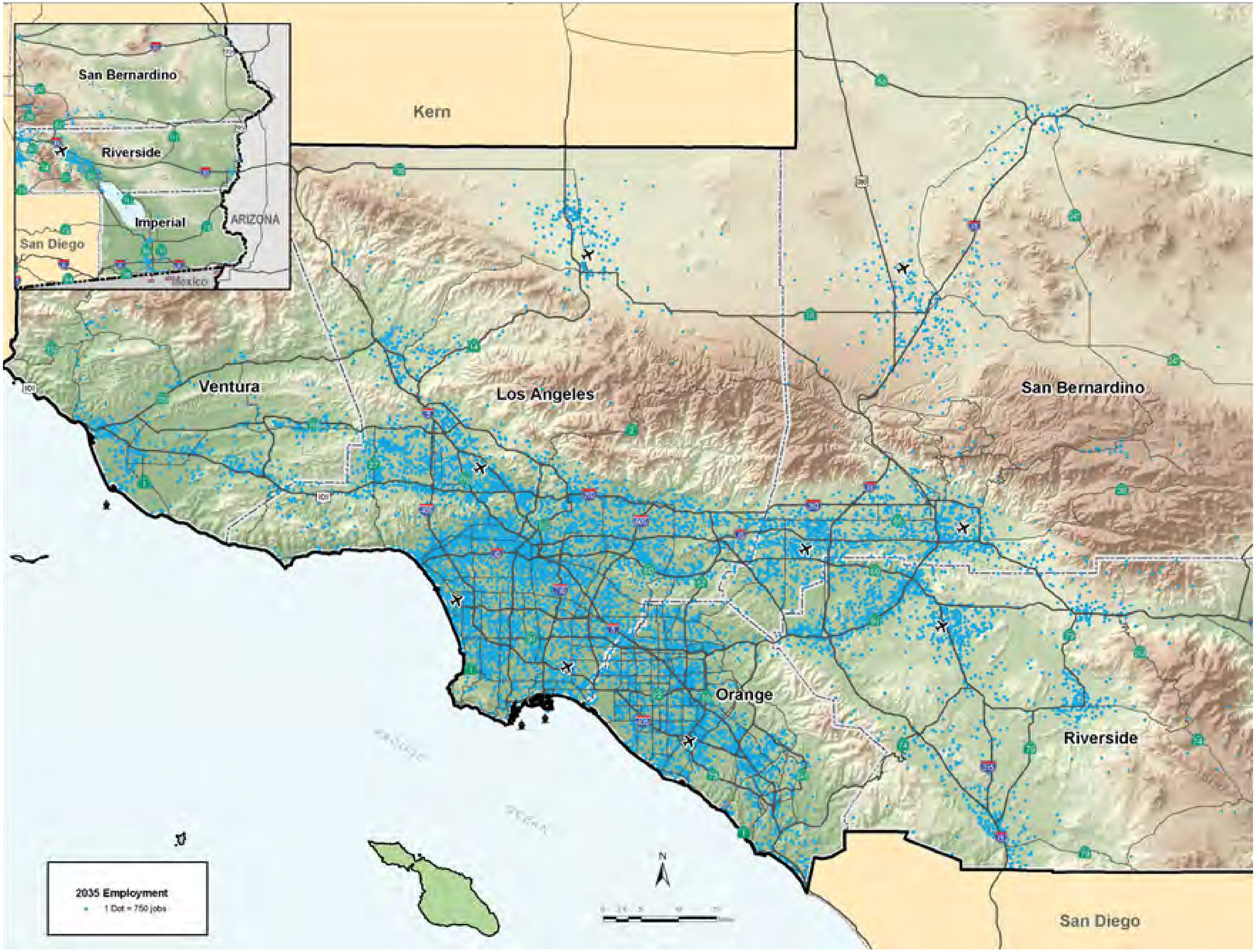
Source: Southern California Association of Governments, ESRI StreetMap USA, Teleatlas

EXHIBIT 2.4 2003 EMPLOYMENT



Source: Southern California Association of Governments, ESRI StreetMap USA, Teleatlas

EXHIBIT 2.5 2035 EMPLOYMENT



Source: Southern California Association of Governments, ESRI StreetMap USA, Teleatlas

EXHIBIT 2.6 EMPLOYMENT INCREASE, 2003-2035

Source: Southern California Association of Governments, ESRI StreetMap USA, Teleatlas

TABLE 2.5 2035 POPULATION, HOUSEHOLDS, AND EMPLOYMENT (THOUSANDS)

County	Baseline			Policy		
	Population	Households	Employment	Population	Households	Employment
Imperial	320	103	133	314	101	132
Los Angeles	12,338	4,003	5,041	12,588	4,087	5,091
Orange	3,654	1,118	1,982	3,699	1,134	1,991
Riverside	3,597	1,183	1,414	3,472	1,142	1,387
San Bernardino	3,134	973	1,255	2,957	914	1,220
Ventura	1,014	330	463	1,025	334	466
SCAG Region	**24,056**	**7,710**	**10,287**	**24,056**	**7,710**	**10,287**

Source: SCAG Baseline and Policy Growth Forecast

Where do we live and work now, and where will we live and work in the future? The regional baseline forecasts are distributed to counties, subregions, and smaller geographies through an interactive collaborative process in which cities, subregions, regional agencies, experts, and stakeholders participated. Input from local jurisdictions plays an important role in determining the baseline growth distribution within their boundaries. Exhibit 2.1 shows where we live in 2003 and Exhibit 2.2 shows where we are forecast to live in 2035. Exhibit 2.3 shows the difference between the two time periods. In terms of where we work, Exhibit 2.4 shows 2003 employment clusters, while Exhibit 2.5 shows anticipated 2035 employment clusters. As with population, Exhibit 2.6 shows the differences. The baseline forecast supports the current urban sprawl from Los Angeles and Orange Counties to Riverside and San Bernardino Counties. It would yield a growth scenario very similar to the status quo, taking a somewhat "business as usual" approach that is not steered by regional policies. Thus, for example, fast-growing suburban cities would likely continue to grow primarily through auto-oriented single family housing with commercial activities focused toward the highway system. The baseline growth distributions would result in severe traffic congestion and vehicle emission. The baseline land use could be tempered, and in some cases bolstered, by policies and programs designed to improve future travel patterns and vehicle emissions.

Mobility Challenges

The projected growth in the region is expected to place even greater demands on the transportation system. The SCAG region is served by an extensive multimodal transportation system addressing all aspects of travel in the region, including commuters, shoppers, public transit patrons, truckers delivering goods both regionally and locally, such as groceries to the local supermarkets, as well as fire, police, and other emergency personnel. The roadway and freight rail networks serve the largest maritime ports system in the United States (the Ports of Long Beach, Los Angeles, and Hueneme) and a number of large airports, including the fifth-largest airport in the world (Los Angeles International Airport – LAX).

The region has over 20,750 centerline miles and over 65,000 lane-miles of roadways, including one of the most extensive High-Occupancy Vehicle (HOV) lane systems in the country. Additionally, the region has a growing network of tolled lanes and High Occupancy Toll (HOT) lanes. Regionally significant arterials provide access to the freeway system and often serve as parallel alternate routes; in some cases, they are the only major system of transportation available to travelers.

The public transit network in the SCAG region has been growing significantly over the last two decades, and this growth accelerated since the 2004 RTP. The region has approximately 640 bus routes and about 50 local bus operators, four commuter express bus services, two subway lines and three light rail lines operating in Los Angeles County, and the Metrolink commuter rail network spanning five of the six counties and northern San Diego County.

Despite this vast multimodal network, transportation in the SCAG region is facing serious, unprecedented challenges. Although the first thought about Southern California transportation is congestion, other major related challenges are equally (or more) serious.

To truly understand these challenges, it is important to understand how we got to this point. How did we become the most congested metropolitan region in the country? Only by developing an in-depth understanding of the current situation and the factors that led to this situation can we try to develop consensus on the tough choices that are before us.

ROADWAY CONGESTION

The second-largest metropolitan area in the United States with over half of California's residents, the Southern California region is the most congested metropolitan area in the country. Over the past twenty years, traffic delays have nearly tripled in the region, and SCAG's Regional Transportation Model estimates the following alarming traffic delay statistics (defined as the difference in travel time between free flow conditions and actual conditions):

- 3.9 million vehicle hours of daily delay
- 5.7 million person hours of daily delay
- 15 minutes of delay per capita during peak commute periods

Almost as frustrating as daily recurrent delay is the variability of travel time. For example, trips that on average take 30 minutes often last much longer due to incidents, collisions, weather, special events, construction activities, or other difficult-to-predict conditions. The frequency of such unpredictable delays over and beyond the "normal" congestion has been increasing steadily on our roadways. The combination of increasing congestion and decreasing predictability of travel times has led to our region's status as the capital of congestion in the country.

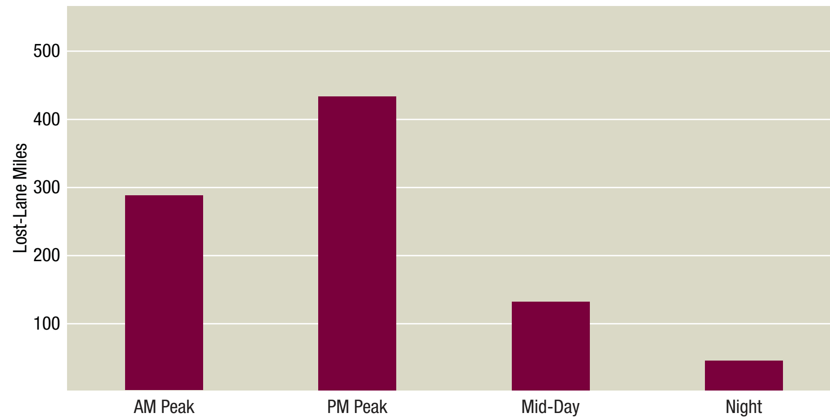
ROADWAY PRODUCTIVITY LOSSES

Roadways are built to provide traffic capacity to vehicles. For instance, freeways are generally built to provide a capacity of between 1,600 and 2,000 vehicles per hour per lane. When a segment of the freeway provides this "design" capacity, it is considered productive. However, the roadway system loses its productivity when it is unable to provide the capacity that it was designed to serve. This occurs at locations commonly referred to by transportation planners and engineers as bottlenecks and the queues building up behind these bottlenecks (e.g., at freeway-to-freeway interchanges). The resulting productivity losses of the system occur generally during peak demand periods and are caused by merges, weaves, lane drops, stalls, accidents, and other factors. So in effect, when demand is highest, system productivity actually decreases. Many freeway segments in the SCAG region experience productivity losses and end up serving between 1,000 and 1,500 vehicles per hour per lane instead of the almost 2,000 vehicles per hour per lane for which they were designed.

When these productivity losses are aggregated, they can be presented in terms of "Lost Lane Miles," which reflect the equivalent capacity subtracted from the roadway system. Figure 2.8 presents the results of an analysis to estimate the lost productivity in the SCAG region based on actual traffic data from the region's freeway system during the four major time periods of the day: AM Peak, PM Peak, Mid-Day, and Night.

This "lost" capacity in the AM peak period, attributable to a large extent to non-recurring incidents such as accidents, weather conditions, stalled vehicles, etc. could have the effect of the loss of approximately 286 lane miles of freeway capacity when it is needed the most. The cost of physically adding this lost capacity by widening existing facilities would exceed $4 billion.

FIGURE 2.8 PRODUCTIVITY RESULTS BY TIME PERIOD

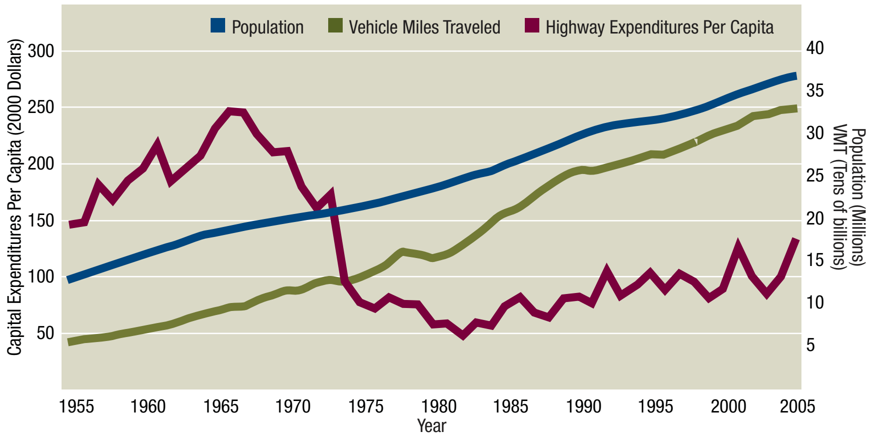


Source: Freeway Performance Measurement System (PeMS)

SUPPLY NOT KEEPING UP WITH DEMAND

As mentioned previously, people are moving further away from established urban areas, at least partly because of housing costs. This creates incremental demand for travel. The size of the roadway system, however, has not kept pace with population and transportation demand. Figure 2.9 illustrates this problem. The figure shows that while California's population and total vehicle miles traveled have more than doubled since 1970, expenditures on this vital system have decreased significantly beginning in the early 1970s and have still not reached the level of investments made during the 1960s. Once the preservation and operations costs are subtracted from these expenditures and the high construction inflation is accounted for, it is easy to understand why the supply of roadways did not keep up with the demand growth for over three decades.

FIGURE 2.9 CALIFORNIA POPULATION, TRAVEL, AND HIGHWAY EXPENDITURE TRENDS*



** Includes expenditures for local assistance and state highway capital outlay. Office of Transportation Economics/DOTP 9/2006*

Source: California Department of Transportation

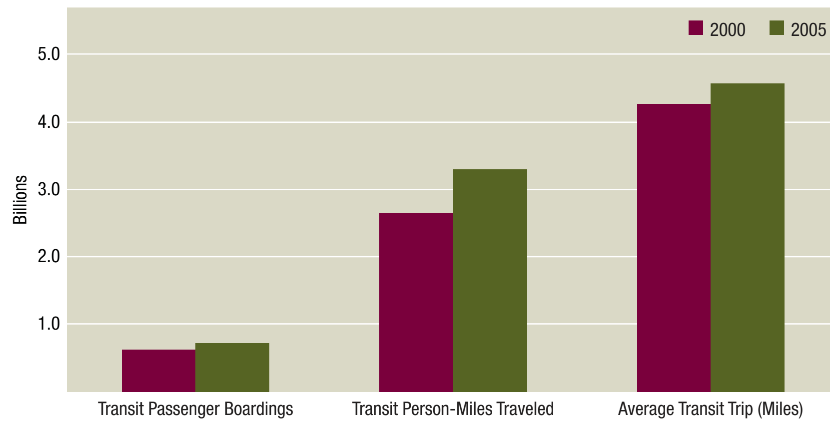
Note that these trends were not altogether unintentional. In fact, starting in 1980, a major shift occurred away from building roadways and into transit projects and services. This trend was planned and executed deliberately and understandably.

GROWING, BUT STILL MODEST PUBLIC TRANSIT USAGE

The investments in public transit since the 1980s have started to pay off. This success of transit is easily measured. Between 2000 and 2005, regional transit use increased by more than 16 percent, from 622 annual unlinked passenger trips to more than 722 million, as shown in Figure 2.10. Transit person-miles traveled (PMT) increased by more than 24 percent to nearly 3.3 billion person-miles in 2005.

Continuing a trend of more per capita transit use that began in the mid-1990s, transit ridership per capita has reached nearly 40 boardings per person in the region by 2005. This rate had not been seen since the mid-1980s. Our regional investments in new transit modes and innovative services are a significant factor in achieving this growth. Additionally, more people are traveling longer distances, as shown in Figure 2.10. The length of an average transit trip increased from under 4.3 miles in 2000 to more than 4.5 miles in 2005. This represents a seven percent increase.

FIGURE 2.10 TRANSIT BOARDINGS AND PERSON-MILES TRAVELED, 2000-2005



Source: Federal Transit Administration (FTA) National Transit Database

However, regional transit operators still struggle to attract a significantly higher share of the traveling public. Despite the increase in boardings and per capita transit use, SCAG's Regional Travel Demand Model estimates that in 2003, less than 3 percent of all trips and person-miles traveled in the region were taken on public transit. A bright note is that since the rate of growth in transit use has outpaced growth in highway and arterial VMT by more than threefold since the year 2000, there are indications that regional investments may attract a greater share of the public in the future, especially with rising gasoline prices.

The development of new rail and bus transit corridors has spawned investment in new housing, retail, and business development at and near transit stations. These changes in land use, as outlined in the Compass Blueprint program, primarily through transit-oriented development, may result in fewer auto trips and reduced VMT by creating an urban environments that provide better access to jobs and services, which in turn encourages more walking, bicycling and transit use.

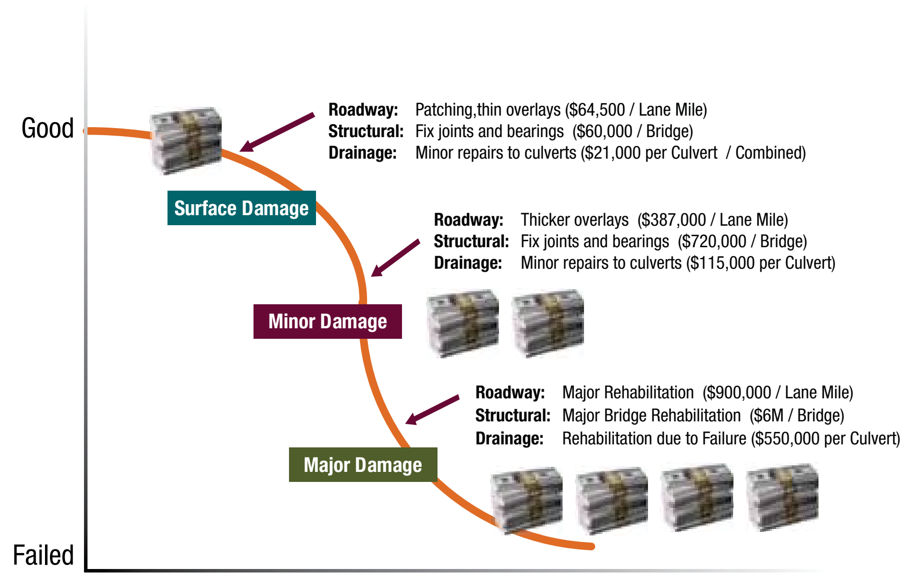
AGING INFRASTRUCTURE

The need to preserve our transportation assets adequately was brought to the nation's attention after the Minnesota I-35W bridge collapse during the summer of 2007. We must recognize that our roadway network and transit systems developed over the past decades are aging. These regional assets represent hundreds of billions of dollars of investments that must be protected in order to serve us and future generations. Without these assets, or even a portion of these assets, the region's mobility would be significantly compromised.

Unfortunately, our region's roadways, especially the State Highway System that is owned and operated by Caltrans, have not been maintained adequately. Caltrans reports that 28 percent of its pavement requires rehabilitation (based on 2005 statistics). Regional arterial studies have concluded similar needs.

Deferred maintenance leads to higher costs, as shown in Figure 2.11. Whereas pavement surface damage requires an investment of $64,000 per lane mile to bring it to a state of good repair, the costs escalate significantly if these investments are not secured in a timely manner. In fact, the costs for minor damage repair escalate more than fivefold to $387,000, and the costs for major damage repair escalate to an astronomical $900,000 per lane mile.

FIGURE 2.11 PRESERVATION COST-EFFECTIVENESS



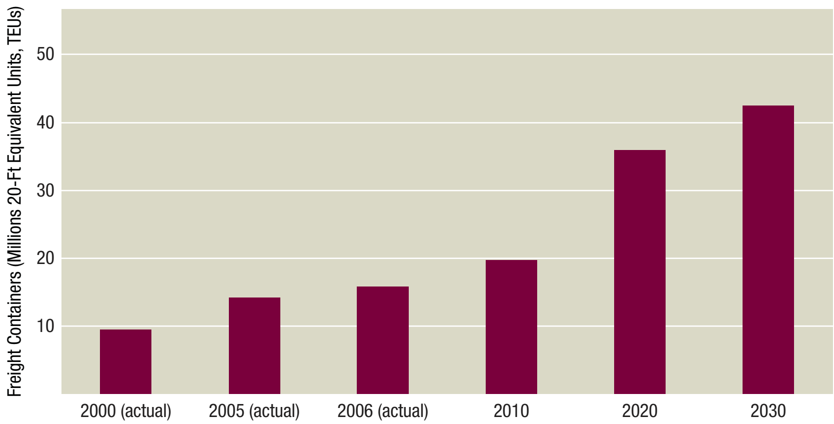
EXPLOSIVE GROWTH IN GOODS MOVEMENT

The SCAG region's goods movement system serves as the gateway for both international and domestic commerce. Supported in part by its geographical advantages such as deep-water marine ports, and highly developed network of highways and railways, availability of transloading facilities and its large internal market, goods movement is the fastest-growing segment of the region's transportation sector. Every state in the nation receives goods that pass through Southern California, and the region is a cornerstone of the nation's global competitiveness.

The San Pedro Bay Ports, which include the Los Angeles and Long Beach Ports, currently handle approximately 40 percent of the volume imported into the country and approximately 24 percent of the nation's exports, and one out of every seven jobs in Southern California depends on this trade. Figure 2.12 reflects the explosive growth in container volume processed by the San Pedro

Bay Ports. It shows an almost 60 percent increase in volume between the years 2000 and 2006. Moreover, it also shows that this type of growth will continue, leading to an almost tripling of container volume by 2030.

FIGURE 2.12 SAN PEDRO BAY PORTS CONTAINER VOLUME TREND AND PROJECTIONS



Source: Port of Long Beach and Port of Los Angeles

As the only deep-water port between Los Angeles and San Francisco, the Port of Hueneme in Ventura County is a major shipping point for automobiles, fresh fruit and produce. Approximately $7 billion in cargo traverses through this Port annually, and trade related activity generated by the Port contributes significantly to the local economy.

Cross-border trade activity also contributes to the region's international trade growth, with the growth in Mexico's manufacturing industry increasing truck trips through Calexico East in Imperial County by 77 percent between 1994 and 2005.

More than 60 percent of the containers processed by the ports will involve a truck trip within the SCAG region, either to a rail intermodal facility, a warehouse, or a transload facility. These trucks contribute to the existing congestion in the region and will contribute to future congestion even more as the number of trucks is projected to more than double for several major freeways, as shown in Table 2.6.

TABLE 2.6 DAILY TRUCK VOLUMES BY CORRIDOR (THOUSANDS)

Freeway	2002	2025
I-110	18.6	39.2
I-405	22.3	42.6
I-10	20.4	43.3
US-101	20.7	43.4
I-105	26.1	54.9
I-5	40.9	85.9
I-710	47.3	99.3
SR-60	50.4	105.8

Sources: California Department of Transportation and SCAG model

Recent projections included in SCAG's Inland Empire Railroad Main Line Study suggest that the number of freight trains on most Burlington Northern Santa Fe (BNSF) and Union Pacific (UP) lines will more than double between 2000 and 2025 in response to a tripling of container volume at the San Pedro Bay Ports. Although freight rail does not add to freeway congestion, it does pose serious quality of life issues for many communities. Some towns and cities witness 100 trains per day that literally split their communities into two sections for extended periods of time. Exhibit 2.8 shows the Colton crossing and suggests how rail traffic can seriously affect the quality of life and safety of a community.

EXHIBIT 2.7 SCAG REGION REGIONAL AIR CARRIER SYSTEM

Source: Southern California Association of Governments, ESRI StreetMap USA, Teleatlas

EXHIBIT 2.8 COLTON AT-GRADE RAIL CROSSING

Source: Google Maps

As the expanding goods movement sector continues to have a positive impact on our economy, it will also have critical and far-reaching impacts on our region's transportation system and public health. An essential element to improving the region's goods movement system will be to reduce its current and long term impacts on public health and the environment.

AVIATION CAPACITY AND GROUND ACCESS CONSTRAINTS

The SCAG region supports the nation's largest regional airport system in terms of number of airports and aircraft operations, operating in a very complex airspace environment. Exhibit 2.7 shows the SCAG regional air carrier airport system. The system has six established air carrier airports, including Los Angeles International (LAX), Bob Hope (formerly Burbank), John Wayne, Long Beach, Ontario and Palm Springs. There are also four new and emerging air carrier airports in the Inland Empire and North Los Angeles County. These include San Bernardino International Airport (formerly Norton Air Force Base (AFB)), March Inland Port (joint use with March Air Reserve Base), Southern California Logistics Airport (formerly George AFB) and Palmdale Airport (joint use with Air Force Plant 42). The regional system also includes 45 general aviation airports and two commuter airports, for a total of 57 public use airports.

There are significant challenges in meeting the future airport capacity needs of Southern California. Work on SCAG's 2004 RTP concluded that an Aviation Decentralization Strategy is needed to meet the forecast doubling of air passenger demand by 2030, from the current 90 million annual passengers (MAP) to 170 MAP (according to the 2004 RTP). This is because the four urban air carrier airports in Los Angeles and Orange Counties—LAX, Bob Hope, Long Beach and John Wayne—are all highly constrained. Their collective acreage amounts to 5,540 acres, which is less than 17% of the 34,000 acres of Denver International, and less than the 7,700 acres of Chicago O'Hare. At 3,500 acres, LAX is a very small international airport despite being the third-busiest airport in the country and fifth-busiest in the world in terms of passengers served. All of these urban airports have little room to expand because of severe encroachment by surrounding communities. In addition, two of these airports—Long Beach and John Wayne—have strict limits on allowable flights that are legally enforceable (one is a city ordinance and the other is a court settlement agreement) since they predate the Federal Airport Noise and Capacity Act of 1990 (ANCA).

The challenge of meeting future aviation demand in the SCAG region is inextricably tied to airport ground access, since in order to meet that demand the region will need to get future air passengers from the urban areas of Los Angeles and Orange Counties to available airport capacity in the Inland Empire and North Los Angeles County. The challenge is complicated by the fact that the regional roadway system will become increasingly unreliable, with daily delay on the system expected to more than double. This will place a great burden on the air traveler, who will have to allow for more time to get to the airport to catch his or her flight. It will make it difficult to expand the new airports with available capacity, since until they fully mature they will have few alternative flights to offer air travelers who miss their flights because of unreliable ground access. Unless the regional airport ground access system is substantially improved, many potential air travelers will choose not to fly at all, which will translate to substantial economic loss to the region.

Southern California airports play a crucial role in international trade, particularly with Pacific Rim countries, and to the regional economy. The value of airborne commodity exports out of the Los Angeles Customs District are about equal to waterborne exports, and airborne export values would be significantly greater if service exports, including impacts from tourism, were added to total export values. Therefore, the airport constraints our region faces pose a threat to our regional economy and well-being. A regional strategy is needed to help address this inter-regional mobility challenge.

Air Quality Challenges

The SCAG region continues to have the worst air quality in the nation, even despite improvements gained in the last two decades. The recently documented health impacts of air pollution on people living in the South Coast Air Basin are staggering. Of all the people nationwide that are exposed to PM2.5 levels that exceed the federal health-based standard, 52% live here. Of all the people statewide that are exposed to these levels, 82% live here. This is estimated to result in 5,400 premature deaths and 980,000 lost work days per year. These impacts, and the fact that a substantial portion of emissions are outside of local and state control, led SCAG to urge via Resolution the declaration of a state and federal emergency to address the air quality health crisis. Subsequently, the South Coast Air Quality Management District (SCAQMD), the California Air Resources Board (ARB), and SCAG collaboratively completed the difficult task of developing a plan to achieve the federal health-based PM2.5 and ozone standards in the South Coast Air Basin. Implementation of this plan will require vigorous effort and significant resources from both public and private stakeholders.

ATTAINMENT OF AIR QUALITY STANDARDS

Much of the region continues to exceed the National Ambient Air Quality Standards (NAAQS) identified in the Clean Air Act. The table below summarizes the non-attainment and maintenance areas within the SCAG region.

TABLE 2.7 SCAG REGION NON-ATTAINMENT AND MAINTENANCE AREAS

Ozone	PM10	PM2.5	CO	NO_2
South Coast Air Basin (SCAB), Coachella Valley portion of Salton Sea Air Basin (SSAB), Ventura County portion of South Central Coast Air Basin (SCCAB), Western portion of Mojave Desert Air Basin (MDAB), Imperial County portion of SSAB	SCAB, Coachella Valley portion of SSAB, San Bernardino portion of MDAB, Imperial County portion of SSAB	SCAB	SCAB	SCAB

Further, as demonstrated by the recent AQMP/SIP efforts of local air districts and the ARB, the region's efforts to attain the NAAQS continue to be challenging, as the South Coast Air Basin, the Ventura County portion of the South Central Coast Air Basin, and the Mojave and Antelope Valley Air Basins

will all be "bumping up" to worse ozone non-attainment designations since they cannot achieve the NAAQS in the time previously assumed. Further, the attainment plan to meet the ozone standard in the South Coast Air Basin includes undefined long-term ("black box") measures of approximately 200 tons per day of nitrogen oxides (NOx), which is a daunting amount of as-yet-unidentified emission reductions. Of additional concern are the upcoming 24-hour PM2.5 standards, which will require even greater reductions as well as possibly more stringent ozone standards. Consequently, the ARB, SCAQMD, and SCAG are committed to producing a white paper that identifies strategies to address the shortfall issues. Furthermore, there are strategies and programs in this Plan that will be incorporated into the white paper.

AIR QUALITY IMPACTS AND PROJECT IMPLEMENTATION

Another important consideration for air quality and transportation planning is the general inability of project sponsors to move proposed projects through the environmental review process. Community opposition is demanding mitigation of emissions from existing as well as future transportation facilities. Of equal concern, the failure to implement adequate SIPs for the region could result in federal sanctions, such as a ban on approval of new highway projects, loss of highway funding and restrict our ability to spend local and private dollars, as well as more stringent emissions offsets for stationary sources.

Given the challenges that lie ahead, increased public awareness and a reinvigorated collaborative effort from all agencies and stakeholders is critical to bring this region into attainment of the federal air quality standards and to begin to address greenhouse gas (GHG) reduction targets. SCAG's contribution to this collaborative effort is essential, as emissions reductions from goods movement, marine ports, aviation and land use have come to be the front and center of the air quality challenge.

Climate Change

In addition to the aforementioned challenges, efforts to reduce GHGs will present another tremendous challenge to the transportation sector. Trans-

portation is the largest source of GHG emissions in California, representing 41 percent of emissions (Figure 2.13), and emissions from the transportation sector have grown more rapidly than other sources over the past ten years.[1] California is the second largest emitter of GHG emissions in the United States and the twelfth largest emitter in the world, exceeding most nations. The Intergovernmental Panel on Climate Change of the United Nations has found overwhelming evidence that global climate change is occurring and is caused by human activity.[2] Global climate change involves an increase in the average atmospheric temperature of the earth caused by an enhanced greenhouse effect. Changes to the atmospheric temperatures would likely cause an increase in sea levels and alter weather patterns, thereby increasing the frequency and severity of extreme weather worldwide. Climate change also poses serious risks to our economy, water supply, biodiversity, and public health.[3]

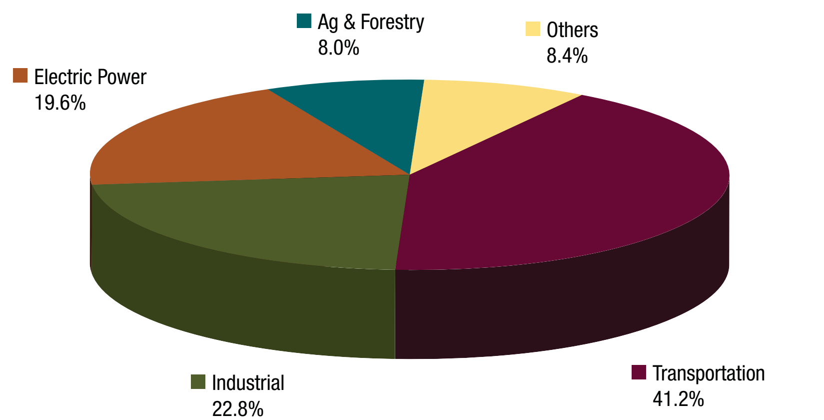
These potentially catastrophic impacts have led to new efforts to reduce the amount of GHG emissions released into the atmosphere. In 2006, California passed the Global Warming Solutions Act, or AB 32, which requires a reduction of the state's GHG emissions to 1990 levels by 2020. This emissions target is equal to a 25% reduction from current levels. Longer term targets have also been set through Executive Order S-3-05, which calls for a reduction of GHG emissions to 80% below 1990 levels by 2050. These reduction targets will have implications on the transportation sector and alter the way we fuel our future. For example, California's Low Carbon Fuel Standard (Executive Order S-01-07) requires a reduction in the carbon intensity of California's passenger vehicle fuels by at least 10 percent by 2020. In addition, AB 1007 requires the development and adoption of a state plan to increase the use of alternative transportation fuels by establishing a roadmap to help reduce our dependence on foreign oil.

[1] United States Department of Transportation, Federal Highway Administration. Transportation and Global Climate Change: A Review and Analysis of the Literature. (June 1998). DOT-T-97-03.

[2] Intergovernmental Panel on Climate Change. (February 2007). Fourth Assessment Report of the IPCC, Climate Change 2007: The Physical Science Basis, Summary For Policy Makers.

[3] California Energy Commission. Our Changing Climate Assessing the Risks to California (July 2006) CEC-500-2006-077. Retrieved March 26, 2007 from http://www.energy.ca.gov/2006publications/CEC-500-2006-077/CEC-500-2006-077.PDF

FIGURE 2.13 2002 CALIFORNIA CLIMATE GREENHOUSE GAS EMISSIONS BY SECTOR



Source: California Environmental Protection Agency, Climate Action Team Report to Governor Schwarzeneggar and the Legislature, March 2006

Energy

Environmental and geopolitical factors are causing energy experts to question the long term viability of a fossil fuel-based energy future. The 2008 RTP begins to recognize the uncertainty of petroleum based future, and seeks to better understand the implications of potential energy constraints. Travel demand forecasts generally assume that the future will include an abundant and relatively inexpensive supply of transportation fuels. If transportation fuel prices continue to increase, it would have a ripple effect on numerous areas including construction costs, gas tax revenue, travel and aviation demand, air emissions, mode choice and growth patterns. One area of uncertainty is how commuters may respond to higher gasoline prices. For example, a recent study suggests that with a ten percent increase in the gas price, there is a less than one percent change in gas consumption,[4] while other data show that

[4] UC Davis. Evidence of a Shift in the Short-Run Price Elasticity of Gasoline Demand. Retrieved

an increase in gas prices coincides with an increase in transit ridership.[5] In addition, growth patterns may alter future demand for transportation fuels. Mixed land uses (i.e., residential developments near work places, restaurants, and shopping centers) with access to public transportation have been shown to save consumers over 500 gallons of gasoline per year.[6] Energy uncertainty requires serious consideration and further study. SCAG, with input from stakeholders, will continue to research the relationship between transportation, land use and energy uncertainty. The following issues have been recommended for additional study and deliberation prior to development of the next Regional Transportation Plan:

- How the price and availability of transportation fuels affects revenues and demand;
- How increases in fuel efficiency could affect revenues and emissions;
- How the cost of commuting and personal travel affects mode choice and growth patterns;
- How the cost of goods movement affects international trade and employment; and
- How the escalation of fuel prices affects the cost of infrastructure construction, maintenance and operation.

November 12, 2007. Available at http://repositories.cdlib.org/ucei/csem/CSEMWP-159/

5 California Energy Commission. Weekly Fuel Prices 1996-2007 and SCAG Transit Ridership data.

6 Victoria Transport Policy Institute. Transportation Demand Management Encyclopedia.

Transportation Finance Challenges

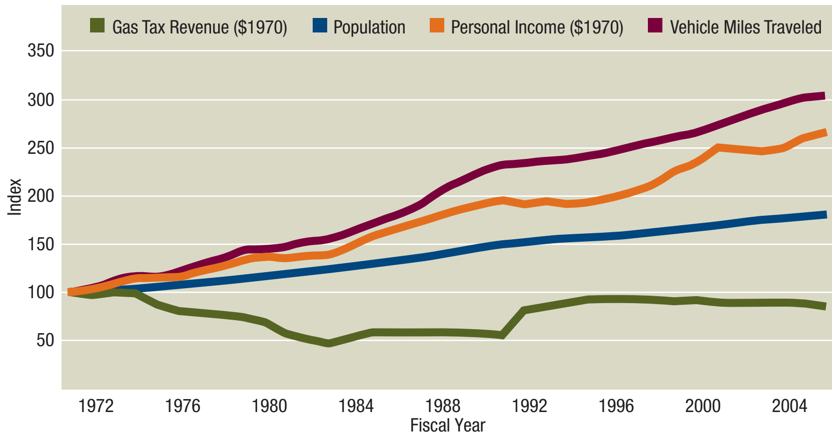
ONGOING FISCAL CHALLENGES

The SCAG region continues to face shortfalls in transportation funding. The following briefly describes current and projected challenges that are likely to impact transportation revenues flowing to the region.

EROSION OF GASOLINE TAX REVENUES DUE TO INFLATION

Over the past four decades, transportation revenues (from gasoline taxes collected per gallon) in California have not kept pace with the state's ever-evolving demographic characteristics. Figure 2.14 shows how these tax revenues have fluctuated in real-dollar terms (adjusted for inflation) in relation to the steady growth in the demographic indicators. Indicators such as vehicle miles traveled, population, and personal income growth have all outpaced the rate of transportation revenue growth. The largest contributing factor is that the gasoline taxes are collected in cents per gallon. Without periodic adjustment or indexing, these funds will not keep pace with needs. Although the passage and recent renewal of local "self-help" transportation sales taxes have greatly improved funding for transportation, gasoline tax revenues continue to decline in value due to inflation.

FIGURE 2.14 REVENUE AND DEMAND TRENDS IN THE SCAG REGION



Sources: California Department of Transportation, California Department of Finance, U.S. Department of Labor

STATUS OF THE STATE HIGHWAY ACCOUNT

The viability of the State Highway Account remains a critical issue. The state's gasoline tax revenues are now exclusively dedicated to funding the needs of the State Highway Operation and Protection Program (SHOPP)—at a level, however, that is considerably less than actual needs. Continued under-investment in the rehabilitation and maintenance needs of the state highway system has serious ramifications—rapidly increasing the number of distressed lane miles on the state highway system and eroding the condition of the state's bridges. In recent years, transportation has relied heavily on the State General Fund to pay for capacity enhancing projects. For example, funding for the State Transportation Improvement Program (STIP) has been dependent on Proposition 42 transfers (sales tax on gasoline). Reliance on the State General Fund means that transportation funding is subject to the state's annual budget process, which can be lengthy and unpredictable. Although the recently passed transportation bond measure (Proposition 1B) serves as an important down payment, reliable and sustainable funding sources for transportation are necessary to meet the needs of a growing population

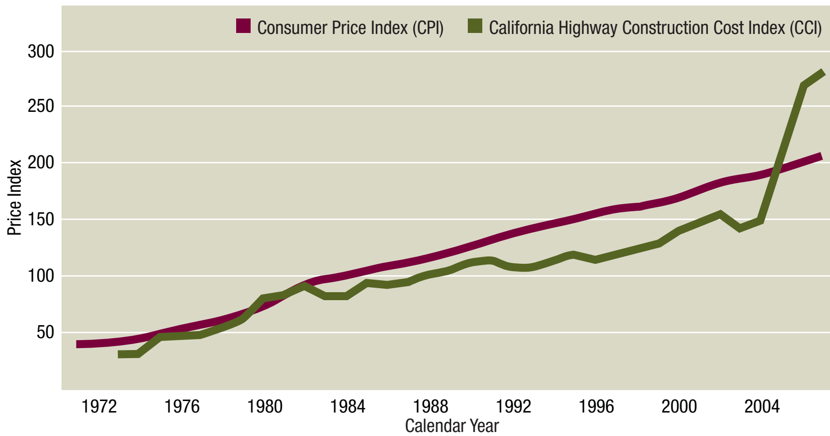
STATUS OF THE FEDERAL HIGHWAY TRUST FUND

The need to establish a reliable and sustainable transportation funding source is even stronger, as the Federal Highway Trust Fund may not have enough resources to meet all of its obligations by the end of the decade. Expenditures authorized under SAFETEA-LU have outstripped revenues generated by the federal per-gallon gasoline tax. As a result, the viability of the Highway Trust Fund will be a critical issue in discussions for the next round of the federal transportation reauthorization legislation, which will start in 2009.

CONSTRUCTION COST INCREASES

Over the last four years, construction costs in California and the nation have increased at an unprecedented rate and much faster than general inflation. Figure 2.15 shows increases in the California Highway Construction Cost Index since the 1970s compared to the Consumer Price Index. The recent run-up in construction prices is due to a variety of factors, including a residential and commercial building boom as well as higher demand for construction materials in developing countries, most notably, China. Although these trends are likely to fluctuate, they have caused many transportation projects to exceed their budgets in the short term and made long-term project cost forecasting uncertain.

FIGURE 2.15 **CALIFORNIA HIGHWAY CONSTRUCTION COST & CONSUMER PRICE INDEX TRENDS**



Source: California Department of Transportation and U.S. Bureau of Labor Statistics